MODIS BU FPAR data set

1. Intent of This Document and POC

1a) This document is intended for users who wish to compare satellite derived observations with climate model output in the context of the CMIP5/IPCC historical experiments. Users are not expected to be experts in satellite derived Earth system observational data. This document summarizes essential information needed for comparing this dataset to climate model output. References are provided at the end of this document to additional information.

This NASA dataset is provided as part of an experimental activity to increase the usability of NASA satellite observational data for the modeling and model analysis communities. This is not a standard NASA satellite instrument product, but does represent an effort on behalf of data experts to identify a product that is appropriate for routine model evaluation. The data may have been reprocessed, reformatted, or created solely for comparisons with climate model output. Community feedback to improve and validate the dataset for modeling usage is appreciated. Email comments to HQ-CLIMATE-OBS@mail.nasa.gov .

Dataset File Name (as it appears on the ESG):

FPAR_MODIS_2000feb-2009dec.ext

1b) Technical point of contact for this dataset:

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2. Data Field Description

CF variable name, units:	Monthly FPAR (%)
Spatial resolution:	0.5°x0.5°
Temporal resolution and extent:	monthly, from 02/2000 to 12/2009
Coverage:	global

3. Data Origin

The operational MODIS Fractional Photosynthetically Active Radiation (FPAR) algorithm ingests up to seven atmosphere-corrected surface spectral bi-directional reflectance factors (BRFs) and their uncertainties and outputs the most probable values for piexel FPAR and their respective dispersions (Myneni et al., 2002). The theoretical basis of the algorithm is given in Knyazikhin et al. (1998) and the implementation aspects are discussed in Knyazikhin et al. (1999). A look-up-table method is used to achieve inversion of the three-dimensional radiative transfer problem. When this method fails to localize a solution, a back-up method based on

relations between the normalized vegetation index (NDVI) and FPAR (Myneni et al., 1997) are utilized together with a biome classification map.

Due to the presence of cloud and seasonal snow cover, the instrument problems and the uncertainties of algorithm, the standard Terra MODIS FPAR products are processed to the MODIS BU FPAR products (Samanta et al., 2011). This is done through a two-stage process. (i) A 1x1km^2 8-day FPAR pixel is considered valid when (a) data is of good quality or (b) Clouds are absent. (ii) Since the 8-day FPAR aerosol flag does not distinguish between average and high aerosol loadings nor reports climatology aerosols, valid 8-day values are averaged to 16-day FPAR whose validity is further determined using corresponding 1x1km^2 VI quality flags cloud and aerosol flags. Valid 1x1km^2 16-day values are aggregated to obtain monthly 8x8km^2 FPAR.

The improved Terra MODIS BU FPAR data sets were resampled to the mothly 0.5°x0.5° data sets for the CMIP5 project.

4. Validation and Uncertainty Estimate

The standard Terra MODIS FPAR products has been tested against field measurements of FPAR (Fensholt et al., 2004; Tian et al., 2004; Ciais et al., 2005; Huemmrich et al., 2005; Olofsson and Ekhlund, 2007; amongst others). The accuracy of the MODIS BU FPAR is 0.1 FPAR, that is, on average, the product differs from field measured FPAR scaled to 1 km resolution by 0.1 FPAR units.

5. Considerations for Model-Observation Comparisons

The MODIS BU FPAR data set provided here is derived from the Terra MODIS standard FPAR product only (MOD15A2). FPAR values equal to ZERO should NOT be used in spatial or temporal averaging process.

6. Instrument Overview

The moderate resolution imaging spectroradiometer (MODIS) is an instrument on board NASA's Terra and Aqua platforms for remote sensing of the Earth's atmosphere, oceans and land surfaces. The Terra platform was launched on December 18, 1999 and the Aqua platform on May 2, 2002. The MODIS instrument has a swath width of 2330 km, orbit height of 705km, and produces global coverage every one to two days. MODIS measures reflected solar and emitted thermal radiation in 36 spectral bands and at three different spatial resolutions (250, 500 and 1000m).

7. References

https://lpdaac.usgs.gov/products/modis_products_table/leaf_area_index_fraction_of_photosynthetically_active_radiation/8_day_l4_global_1km/mod15a2

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